



**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON, D.C. 20460**

**OFFICE OF  
PREVENTION, PESTICIDES AND  
TOXIC SUBSTANCES**

**Memorandum**

**Date:** August 29, 2001

**SUBJECT:** Initial Cotton Benefits Assessment for Azinphos-methyl

**FROM:** William Gross, Entomologist  
Herbicide and Insecticide Branch

Tim Kiely, Economist  
Economic Analysis Branch  
Biological and Economic Analysis Division (7503C)

**THROUGH:** David Brassard, Senior Entomologist  
Jonathan Becker, Acting Chief  
Herbicide and Insecticide Branch

Arthur Grube, Senior Economist  
David Widawsky, Acting Chief  
Economic Analysis Branch

**TO:** Veronique LaCapra, Chemical Review Manager  
Margaret Rice, Chief  
Reregistration Branch 2  
Special Review and Reregistration Division (7508C)

**CC:** Denise Keehner, Director  
Biological and Economic Analysis Division (7503C)

**SUMMARY**

Based on the best available published data and communications with crop experts, BEAD believes that the impacts resulting from extending the restricted entry intervals on cotton for azinphos-methyl will be insignificant. We reached this conclusion based on facts that grower production practices are not likely to be affected by the manipulation of restricted entry intervals. Azinphos-methyl is a minor use insecticide on cotton, and if the proposed restricted entry interval should interfere with its use, BEAD believes that it would be replaced with one of several efficacious and comparably priced alternatives.

**BACKGROUND**

Cotton is a perennial crop that is typically grown as an annual. After harvest in the fall, the plant remnants are discarded and another crop is planted the following spring over plant matter that remains in the field. Depending on geography, climate, and cultural practices, cotton may be planted as early as February through June, and it is generally harvested September through

December. Some cotton-growing states have acreage under no-till, while others rely upon conventional tillage practices. In some arid regions, cotton is irrigated.

Cotton planting dates vary to some extent with soil type, drainage, topography, and latitude. Soil conditions and moisture dictates planting depth. Cotton should be planted to moisture, no deeper than 2 inches. The preferred depth for planting is 3/4 of an inch where conditions are ideal. The desired plant stand is 3-4 plants per foot of row or 40-50,000 plants per acre. Depending on the soil type, plant populations may vary from near 30,000 plants per acre to 55,000 plants per acre and not seriously affect yield. Systemic insecticides (either seed treatment or in-furrow) may reduce the number of plants per acre.

Cotton protected by the *Bacillus thuringiensis* gene became available in the past several years. These plants are protected from certain insects by the expression of the toxins from the gene. These transgenic plants are not being heavily planted (approximately 15% of the cotton acreage in 2000) due to the cost (as much as \$40/acre for seed and technology fee), but where they are planted, fewer insecticides are being applied. However, there is continued concern among growers that pests currently well controlled by *Bt* may become resistant.

### **Early Stages of Cotton Growth**

The cotton plant should be in the second true leaf stage by May 28 and no later than June 28. Some factors that cause the time from emergence to second true leaf to be a maximum are: low temperatures below 65 degrees F, loose and dry seed bed, improper rate or incorporation of herbicides, fertilizer salt damage (placement), standing of water or waterlogged soils (low soil oxygen), or thrips infestation. The first square should appear about the middle of June and no later than the middle of July. Fruiting branches are usually about three days apart, and about 6 days between squares. Cotton fields should be squaring and setting 75 percent of the pin head squares, 1/8 inch in diameter, by the ninth node. Nodes are counted by counting the first two leaves opposite each other, and continue upwards. Factors that might cause cotton to not be setting squares by the ninth node are: 1) exceptionally thick stands; 2) excessive nitrogen; 3) heavy and frequent rains resulting in standing water or waterlogged soils; 4) late planting, after May 15 or 20; and 5) insects.

A major pest of cotton, the boll weevil, is being targeted for removal through the Boll Weevil Eradication Program. This program, initiated in 1978, uses pheromone traps and applications of malathion applied at ultra-low volume (ULV) with multiple applications. The program is voluntary and farmers must help pay for the application. The Program has been very successful in the Mid-Atlantic and Southeastern U.S. and has spread to most other U.S. cotton producing states in recent years. The goal of this program is eradication of the boll weevil in 5 to 7 years. If the program can be successfully completed, overall applications of insecticides are expected to decline.

Cultural practices and production strategies vary across the cotton-growing regions. In Arizona, cotton may be grown on a full season, which maximizes yield; or it may be short season cotton, intended to make the most of early production without the additional costs of a full season. Some fields in Arizona are irrigated for seeding, others are irrigated after the seed is set, depending on soil type. Early maturing cotton is also used in states with shorter growing seasons, such as Missouri.

Harvesting of cotton is achieved using mechanical means. In short season varieties with tight bolls, stripper harvesting is used to collect the entire cotton boll. Waste from the boll is removed at the cotton gin. In picker harvesting, only the seed cotton - the fiber and seeds - are harvested, resulting in cleaner cotton.

Ninety-nine percent of U.S. cotton is grown in the Southeast, West, and Southwest Regions of the U.S. Information on production for the U.S., by region and by state, is available in Table 1. Yields across the cotton-growing region range from 298 pounds per acre in Kansas to 1,371 pounds per acre in California. Annual U.S. cotton production averages nearly 15.5 million bales.

Table 1. Cotton Production and the Value of Production in the U.S., Regions and Major States in Each Region <sup>1</sup>

Region/ States <sup>2</sup>	Harvested Acreage (1000 Acres)	Production (1000 Bales)	Percent of U.S. Production	Percent of Regional Production	Value of Production (\$1000)
U.S.	12,032	15,436	--	--	\$3,978,201
Southeast <sup>3</sup>	6,116	7,886	51%		\$2,034,298
Arkansas	930	1,320	9%	17%	\$350,017
Georgia	1,290	1,556	10%	20%	\$397,920
Louisiana	568	771	5%	10%	\$184,333
Mississippi	1,060	1,592	10%	20%	\$405,594
North Carolina	752	918	6%	12%	\$249,040
West <sup>4</sup>	1,091	2,514	16%	–	\$767,641
California	822	1,847	12%	73%	\$603,549
Southwest <sup>5</sup>	4,733	4,925	32%	–	\$1,146,613
Missouri	374	460	3%	9%	\$133,630
Texas	4,232	4,375	28%	89%	\$1,007,586

1. Source: USDA/NASS 2000 Agricultural Statistics.

2. There are other states and regions where cotton may be grown.

3. Other states included in the Southeast Region: Alabama, Florida, South Carolina, Tennessee, Virginia.

4. Other states included in the West Region: Arizona.

5. Other states included in the Southwest Region: Kansas, Oklahoma.

## USE OF AZINPHOS-METHYL ON COTTON

### Usage:

Approximately 3% percent of the total cotton acres were treated with azinphos-methyl in 1999. Most of the usage occurred in Texas, where 3% of the cotton acres were treated. Changes to the registration of Guthion in 1999 stopped its use east of the Mississippi, and as a result, usage declined nearly 30% in 2000, to 2% of the U.S. cotton acreage treated. Most of the usage occurs in the Texas (See Table 2). Although the usage of azinphos-methyl in Texas increased slightly in 2000, usage has declined steadily since 1994, when 15% of the Texas cotton acreage was treated.

Table 2. Usage of Azinphos-methyl on Cotton <sup>1, 2</sup>

State	1999 Azinphos-methyl Usage <sup>3</sup>			2000 Azinphos-methyl Usage <sup>3</sup>		
	Percent Crop Treated	Acres Treated	Pounds a.i. Applied	Percent Crop Treated	Acres Treated	Pounds a.i. Applied
Missouri <sup>4</sup>	5%	20,500	5,000	3%	14,000	6,000
Texas	3%	184,000	128,000	4%	256,000	136,000
United States	3%	399,000	211,000	2%	288,000	143,000

1. Usage data based on USDA/NASS Field Crop Chemical Usage for 1999 and 2000, USDA Missouri cotton crop profile, and EPA proprietary data.

2. Azinphos-methyl not allowed east of the Mississippi after 1999 growing season.

3. Other states estimated to have used azinphos-methyl on cotton, but usage not quantified by USDA/NASS in 1999: Arkansas, Louisiana, Mississippi and Tennessee; and in 2000: Arkansas, Arizona, Mississippi, and Tennessee.

4. Usage data based on USDA Crop Profile for Cotton in Missouri and EPA proprietary data.

### **Target Pests:**

According to both the Texas and Missouri USDA Crop Profiles for Cotton, the primary target pest of azinphos-methyl in these states is the boll weevil. The boll weevil is one of the cotton industry's major pests. Its damage causes cotton squares to fall from the plant, or for bolls to yield poorly. Scouting and trapping are used to determine boll weevil populations. In Texas, more than a third of insecticide applications are made to control the boll weevil.

Boll weevil pheromone traps are employed to determine the population level just prior to and at squaring. The first treatment of azinphos-methyl would be applied the week of the first small squares if trap catches the previous week average three or more weevils per trap. If traps average 3 or more weevils after the first treatment, two additional applications could be made at 5 to 7 day intervals. Maximum label rate for cotton is 0.5 lb. a.i./acre, with a seasonal maximum of 2 lbs. a.i./acre.

### **Alternative Pest Control Methods:**

For the control of the boll weevil, there are a number of efficacious and cost effective alternatives to azinphos-methyl, as identified in the Texas State Recommendations and the USDA cotton crop profiles. These include lambda-cyhalothrin, cyfluthrin, dicotophos, endosulfan, imidacloprid, malathion, zeta-cypermethrin, and oxamyl. In addition, the Boll Weevil Eradication Program, which uses a ULV formulation of malathion to target and eradicate the boll weevil, is in use in Texas and begins in Missouri this year. In 2000, malathion was applied to 36% of the U.S. cotton acreage and 41% of the Texas cotton acreage.

A limited amount of control for the boll weevil can be achieved through biological control from predation by the fire ant. The ants attack the larvae and pupae of the boll weevil, but have no effect on the adults. In addition, fire ants are themselves considered an undesirable pest in areas where machinery, humans, or livestock frequent.

Other non-chemical control methods include trapping for suicidal emergence of female weevils in early spring before cotton is planted fall diapause control programs, and early termination of the crop and stalk destruction to reduce over-wintering.

## **RESTRICTED ENTRY INTERVALS**

The current restricted entry interval for azinphos-methyl on cotton is 2 days for mowing, irrigating, and scouting, and 4 days for all other activities. Please refer to the occupational and residential human health risk assessment on the Agency's website (<http://www.epa.gov/pesticides/op>) for information concerning the worker risks associated with the restricted entry intervals for this chemical. The pre-harvest interval for this chemical is 7 days.

Cotton is nearly 100% machine harvested and bundled, so extending the REIs for will not have an impact on the harvest of cotton. Further, BEAD has not identified any other critical activity in Southwestern cotton production that would be impacted by extending the REIs.

## **IMPACTS RELATED TO OCCUPATIONAL RISK MITIGATION**

Based on available published data and personal communications with crop experts, BEAD believes that there will not be significant impacts to cotton growers from extending the restricted entry intervals on cotton for azinphos-methyl. In the states where the majority of the use is occurring (i.e., Texas and Missouri) there are a number of efficacious and cost-effective alternatives to azinphos-methyl already in use to control the boll weevil, including malathion as part of the Boll Weevil Eradication Program.

## **LITERATURE CITED**

USDA/NASS, Agricultural Chemical Usage, 1991-2000 Field Crop Summary.

USDA Crop Profile for Cotton in Texas, September 1999.

USDA Crop Profile for Cotton in Missouri, August 2000.

EPA proprietary usage data, 1998-2000.

Cotton Production Guide, Stoneville Pedigreed Seed Company